Introducing the Specifications of the MEF

MEF 7.2: Carrier Ethernet Management Information Model

July 2013

MEF Reference Presentations

- **Intention**
  - These MEF reference presentations are intended to give general overviews of the MEF work and have been approved by the MEF Marketing Committee
  - Further details on the topic are to be found in related specifications, technical overviews, white papers in the MEF public site Information Center:
    http://metroethernetforum.org/InformationCenter

Outline

- Approved MEF Specifications
- Specification Overview
- OAM Overview
- Use Cases
- Summary

Approved MEF Specifications*

Specification	Description
MEF 2	Requirements and Framework for Ethernet Service Protection
MEF 3	Circuit Emulation Service Definitions, Framework and Requirements in Metro Ethernet Networks
MEF 4	Metro Ethernet Network Architecture Framework Part 1: Generic Framework
MEF 6.1	Metro Ethernet Services Definitions Phase 2
MEF 7.2	Carrier Ethernet Management Information Model
MEF 8	Implementation Agreement for the Emulation of PDH Circuits over Metro Ethernet Networks
MEF 9	Abstract Test Suite for Ethernet Services at the UNI
MEF 10.2	Ethernet Services Attributes Phase 2
MEF 11	User Network Interface (UNI) Requirements and Framework
MEF 12.1	Metro Ethernet Network Architecture Framework Part 2: Ethernet Services Layer
MEF 13	User Network Interface (UNI) Type 1 Implementation Agreement
MEF 14	Abstract Test Suite for Traffic Management Phase 1
MEF 15	Requirements for Management of Metro Ethernet Phase 1 Network Elements
MEF 16	Ethernet Local Management Interface

*Current at time of publication. See MEF web site for official current list, minor updates and superseded work (such as MEF 1 and MEF 5)

Approved MEF Specifications

Specification	Description
MEF 17	Service OAM Framework and Requirements
MEF 18	Abstract Test Suite for Circuit Emulation Services
MEF 19	Abstract Test Suite for UNI Type 1
MEF 20	User Network Interface (UNI) Type 2 Implementation Agreement
MEF 21	Abstract Test Suite for UNI Type 2 Part 1: Link OAM
MEF 22.1	Mobile Backhaul Implementation Agreement Phase 2
MEF 23.1	Class of Service Implementation Agreement Phase 2
MEF 24	Abstract Test Suite for UNI Type 2 Part 2: E-LMI
MEF 25	Abstract Test Suite for UNI Type 2 Part 3: Service OAM
MEF 26.1	External Network Network Interface (ENNI) – Phase 2
MEF 27	Abstract Test Suite For UNI Type 2 Part 5: Enhanced UNI Attributes & Part 6: L2CP Handling
MEF 28	External Network Network Interface (ENNI) Support for UNI Tunnel Access and Virtual UNI
MEF 29	Ethernet Services Constructs

Approved MEF Specifications

Specification	Description
MEF 30.1	Service OAM Fault Management Implementation Agreement: Phase 2
MEF 31	Service OAM Fault Management Definition of Managed Objects
MEF 32	Requirements for Service Protection Across External Interfaces
MEF 33	Ethernet Access Services Definition
MEF 34	Abstract Test Suite for Ethernet Access Services
MEF 35	Service OAM Performance Monitoring Implementation Agreement
MEF 36	Service OAM SNMP MIB for Performance Monitoring
MEF 37	Abstract Test Suite for ENNI
MEF 38	Service OAM Fault Management YANG Modules Technical Specification
MEF 39	Service OAM Performance Monitoring YANG Modules Technical Specifications
MEF 40	UNI and EVC Definition of Managed Objects

*Current at time of publication. See MEF web site for official current list, minor updates (such as MEF 31.0.1 amendment to this document) and superseded work (such as MEF 1 and MEF 5)

MEF Specification Overview

MEF 7 - EMS-NMS Information Model Element Management System–Network Management System	
Purpose	This Specification defines a common set of managed object definitions that are consistent and readily integrated into a Carrier Ethernet Provider's operations environment. This common management model helps ensure that vendors provide management functionality and information in their OSSs, NMSs, EMSs, and NEs in a logically consistent fashion, and allows service providers to readily integrate such capabilities into their management environment..
Audience	• Equipment Manufacturers building devices that will carry Carrier Ethernet Services • Useful for Service Providers architecting their systems and providing services. • Tool vendors for developing back office applications

About MEF 7.2

- **Purpose:**
  - This presentation is an introduction to MEF 7.2 – Carrier Ethernet Management Information Model
- **Audience**
  - Equipment Manufacturers building devices that will carry Carrier Ethernet Services
  - Service Providers delivering Carrier Ethernet Services
  - EMS/NMS/OSS tool vendors developing back office applications for managing, provisioning and monitoring Carrier Ethernet Services
- **Other Documents**
  - Presentations of other MEF specifications and an overview of all specifications is available on the MEF web site
  - Other materials such as white papers and case studies are also available

EMS – NMS Information Model

- **A Specification**
  - Enable consistent definition of the management information required to manage Carrier Ethernet.
- **A Model**
  - Defines the specific EMS-NMS management interface and objects for each specific interface profile such as Common Object Request Broker Object (CORBA) IDL, Simple Network Management Protocol (SNMP), JAVA, XML, etc.
- **Scope**
  - Ethernet (ETH) layer UNI configuration provisioning
  - ETH layer configuration and provisioning
  - ETH layer network connection and fault management (including setup/modification, notification, testing)
  - Ethernet External Network Network Interface (ENNI) Service Attributes
  - UNI Tunnel Access (UTA) / Virtual User Network Interface (VUNI) Service Attributes
  - SOAM Service Attributes
  - Virtual Network Interface Device (vNID) Remote Management Interface
  - Ethernet Access Services

OAM Overview

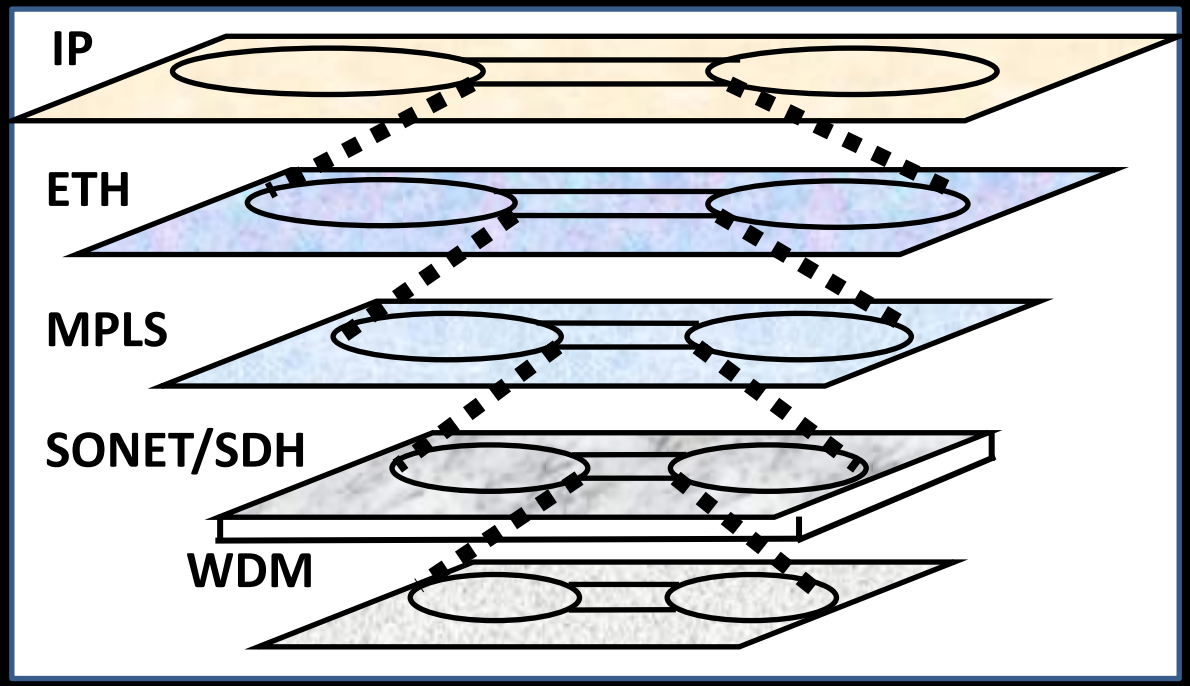
MEF Service OAM

- MEF 7.2 defines a means to provide OAM at the Ethernet Services layer
  - Does not define OAM at the transport link/ network layers
  - Compliments/relies on the work done in the ITU, IEEE and IETF at the Transport data link and Network layers
- Provides a frame work and concepts for managing and monitoring flows across a connectionless network
  - From end to end
  - From Operator to Operator
- Provides mechanism to perform:
  - Node Discovery, Establish connectivity, monitor CoS, and detect service impairments

Key Assumptions behind MEF OAM

- Assumes Ethernet is only common denominator
  - For example: 802.3 Ethernet, Ethernet over SONET/SDH, RPR, etc.
  - Must use Ethernet framing for OAM communications
- Ethernet segments interconnected with forwarding entities (bridges, etc.)
  - Connectionless (like IP)
  - Segment can be real or virtual
- Must measure “per service” and “fate share” with the data plane
  - Out-of-band OAM not reflective of the data plane
  - OAM mixes with user data within the core network
- Small initial focus on “SLA” metrics
  - Connectivity, latency, loss, jitter, availability
- Other functions may follow later
  - Traceroute, RDI/AIS, other
- Domain oriented
  - Domain may be intra-provider, inter-provider, customer-to-customer, etc.

Network Layering Concepts

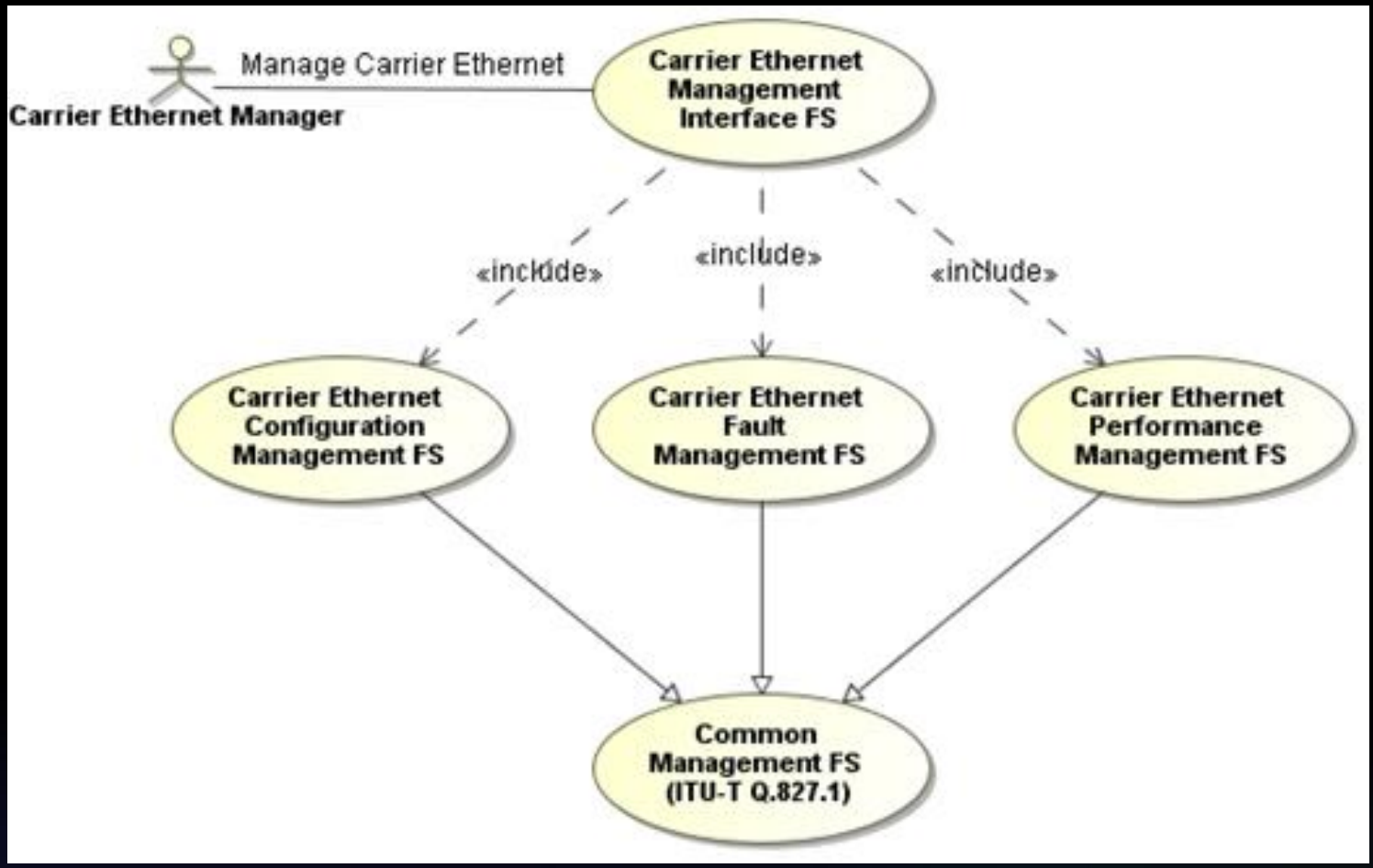


Layer Network Domains (LND)

- Flows, connections and resources can all be managed separately at each LND
- Each can remain independent
- Each in turn can pass information to upper management domains to isolate issues.

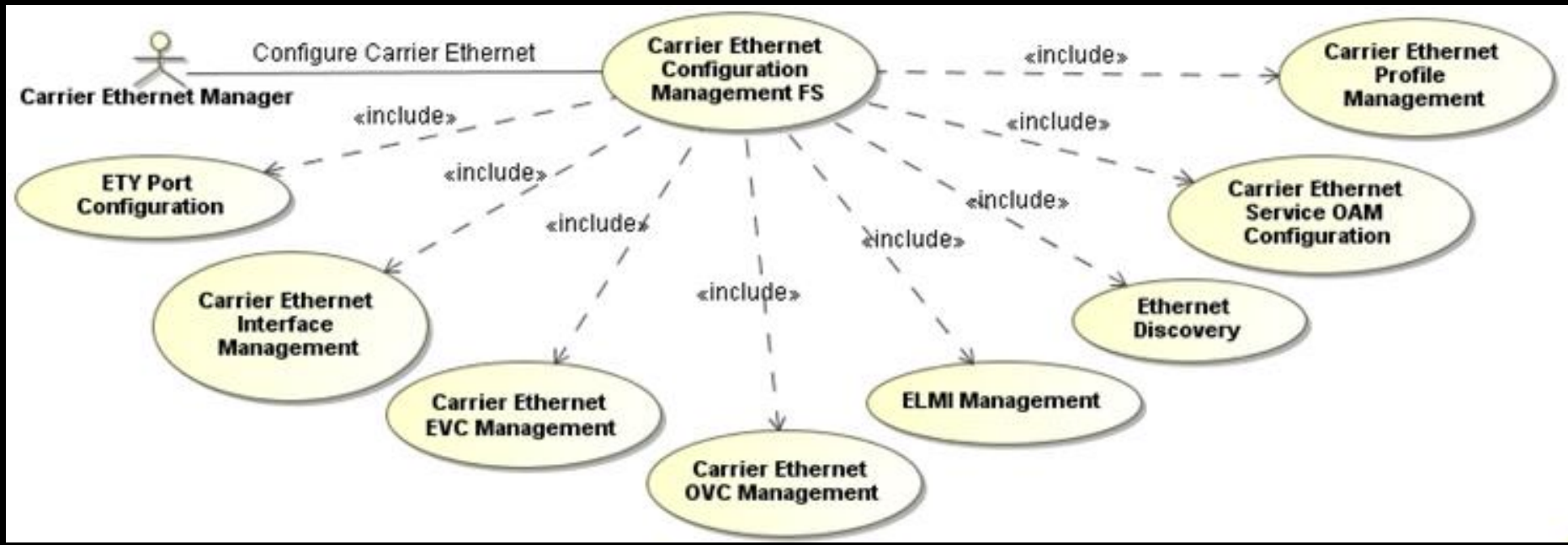
Use Cases

Carrier Ethernet Management



- Management Interface includes Configuration, Fault, Performance, and Common functions

Configuration Management (CM)

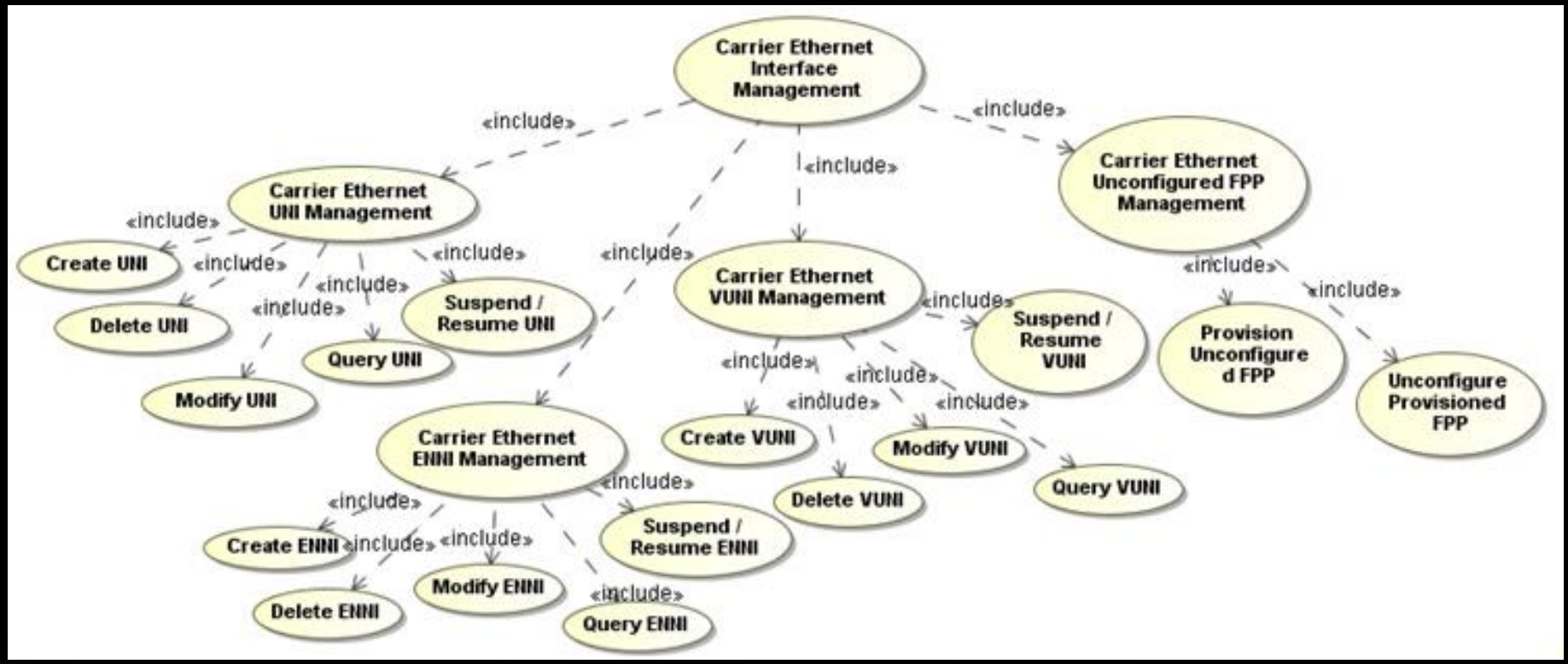


- Provides the description of the various elements necessary for Configuration of Carrier Ethernet
- A couple of Configuration Function examples are given in the following slides

CM Example

- The next slide provides an example of the detail contained in MEF 7.2
- The figure shows the functions for Interface Management
- The slide after that shows the text describing ENNI Creation
- Each function is documented in manner displayed on the ENNI Creation Example slide

CM Example – Interface Management



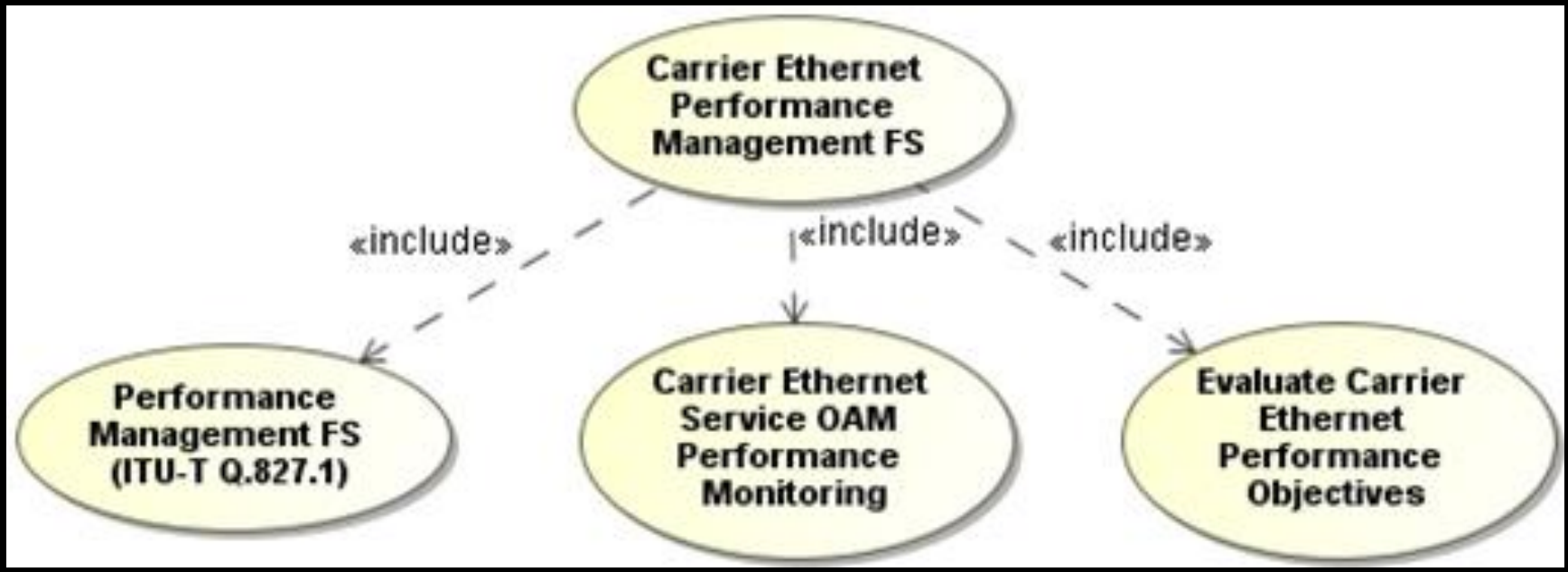
- Create, Delete, Modify, Query functions defined for
  - UNI
  - VUNI
  - ENNI
- Flow Point Pool (FPP) Management

ENNI Creation Example

Name	ETH Flow Point Pool (FPP) ENNI Creation
Summary	The Carrier Ethernet Manager creates and configures an ETH ENNI on a pre-selected port. ETH FPP ENNIs may be created automatically by Managed System when physical ports are created, and can be retrieved by Carrier Ethernet Manager.
Actor(s)	Carrier Ethernet Manager
Assumptions	The Carrier Ethernet Manager has the authority to create the ETH ENNI.
Pre-Conditions	The Carrier Ethernet Manager has established communication with Managed System.
Begins When	The Carrier Ethernet Manager has selected a port (e.g., Generic Transport TTP) and sends a request to provision an ETH_FPP_ENNI representing an Ethernet ENNI on the port.
Description	The Carrier Ethernet Manager needs to create a new ETH ENNI associated with a specific port. The Carrier Ethernet Manager requests the creation of a new Ethernet FPP ENNI to be managed by the Managed System. As part of the creation request, the Carrier Ethernet Manager provides Ethernet ENNI configuration parameters. Based on the creation request, the Managed System creates an instance of ETH FPP ENNI and returns the name of the new ETH FPP ENNI instance. In addition, an Object Creation Notification for the new instance of ETH FPP ENNI is autonomously sent from the Managed System. For an ETH FPP ENNI, the following information may be provided by the Carrier Ethernet Manager as part of the creation request: – FPP Type: Indicates that the ETH FPP is ~~an~~ ENNI. – FPP SubType (Optional): A string that indicates the detailed FPP sub-type. – User Label. – IEEE 802.3Address (Optional): The [IEEE 802.3] address which is placed in the source-address field of any non-FDFr specific Ethernet frames that originate at this interface. – Max Number of Virtual Connections (Optional). – MTU Size.

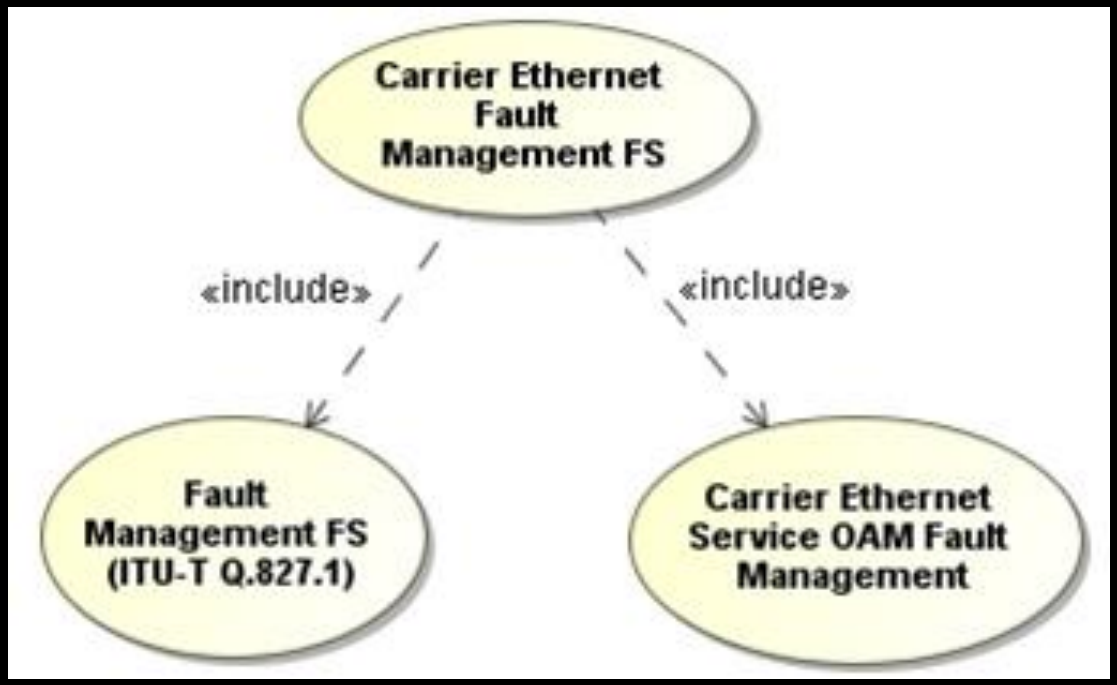
Description (cont.)	– ENNI Label: Describes the ENNI within the scope of the Ethernet provider domain. The ENNI Label attribute is a value that is assigned to the ENNI by the Ethernet Provider. – Protection Mechanism: The method for protection, if any, against a failure. – SVLAN-ID Mapping: The map that associates each S-Tagged ENNI Frame with an End Point. The End Point Type within an End Point Map for ENNI frames mapped to an OVC MUST take the value of "OVC". The End Point Type within an End Point Map for ENNI frames mapped to a VUNI MUST take the value of "VUNI". – Maximum Number of OVC End Points per OVC: The Maximum Number of OVC End Points per OVC provides an upper bound on the number of OVC End Points that are associated by an OVC that the Operator can support at the ENNI. Note that if the Maximum Number of OVC End Points per OVC is one, then hairpin switching cannot be supported at the ENNI. – Supported By (GET, SET BY CREATE): Relationship with supporting objects. – Client/Server (GET, SET BY CREATE): Relationship with TRANS layer TTP (Encapsulation Port). – Flow Domain Interfaces (GET, SET BY CREATE): Relationship with ETH Flow Domain that contains the FPP in a given layer. – Ingress Bandwidth Profile (Optional): This attribute indicates the ingress bandwidth profile for all ETH services at the ETH FPP ENNI in the ingress direction. – Egress Bandwidth Profile (Optional): This attribute indicates the egress bandwidth profile for all ETH services at the ETH FPP ENNI in the egress direction
Ends When	1) Managed System returns the creation response to Carrier Ethernet Manager 2) Exception happens
Exceptions	1) Unknown Managed Entity 2) Managed System Processing Error 3) Invalid Parameter
Post-Conditions	A new instance of ETH Flow Point Pool ENNI is created.

Performance Management



- Functions to control SOAM PM (MEF 35)
- Loss, Delay, and Availability are covered

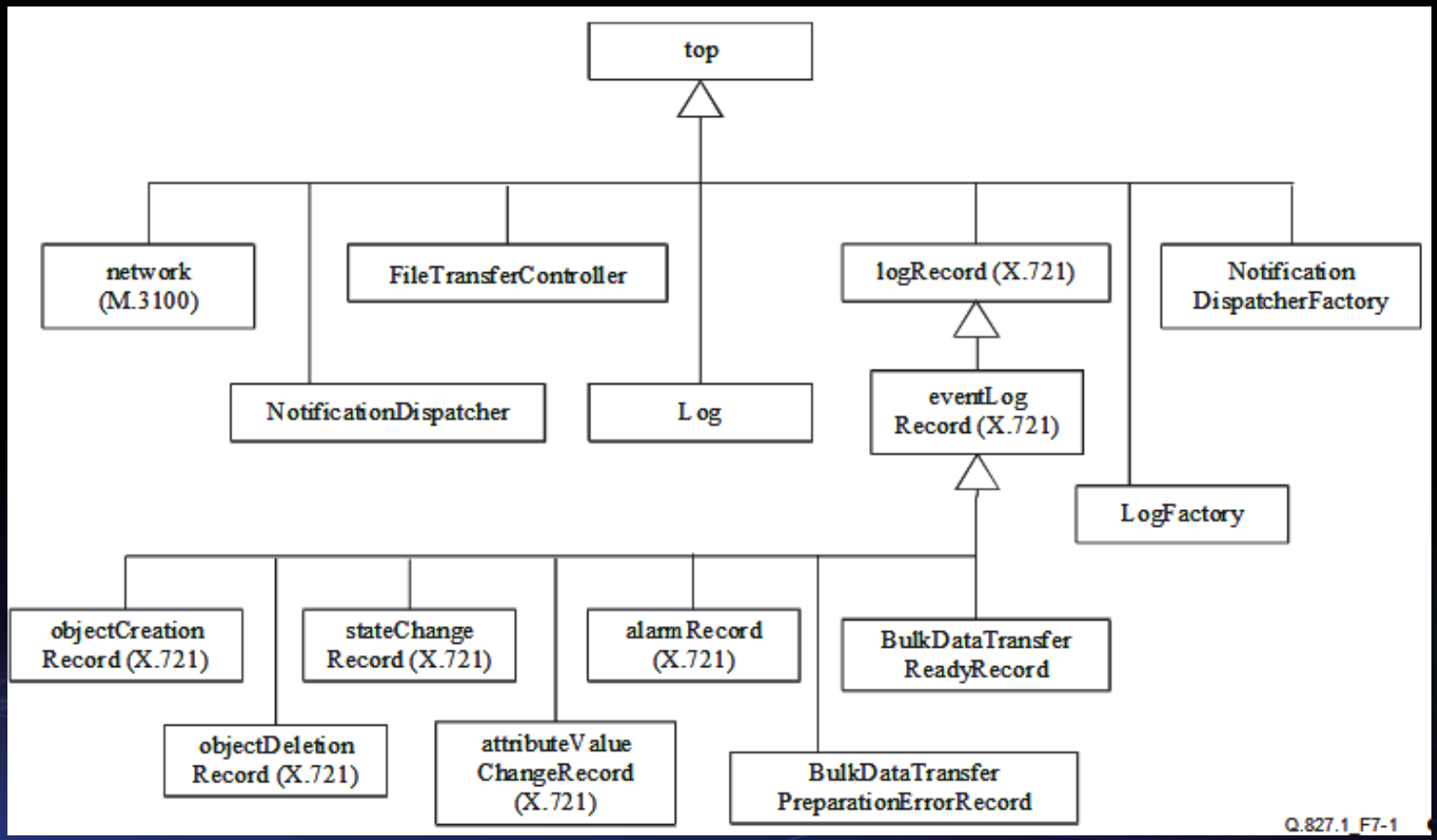
Fault Management



- Fault Management functions as defined by MEF 30
- Loopback, Link Trace, Lock
- Alarm and Notifications

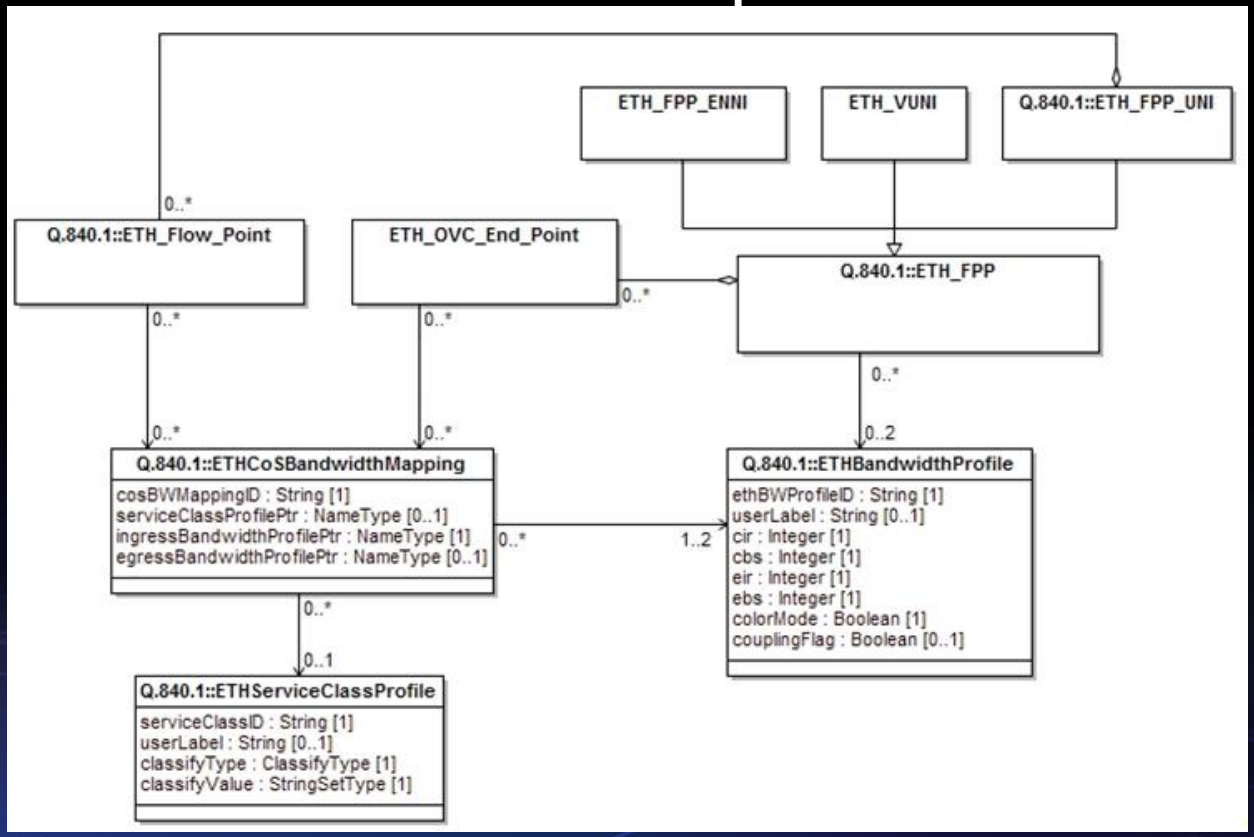
Information Model

- MEF 7.2 provides MEF specific extensions to the ITU-T Q.827.1 information model



MEF Specific Information Model

- MEF 7.2 provides the class object diagrams for the MEF specific Carrier Ethernet Services
- For example, below is the diagram for the ENNI related bandwidth profile attributes:



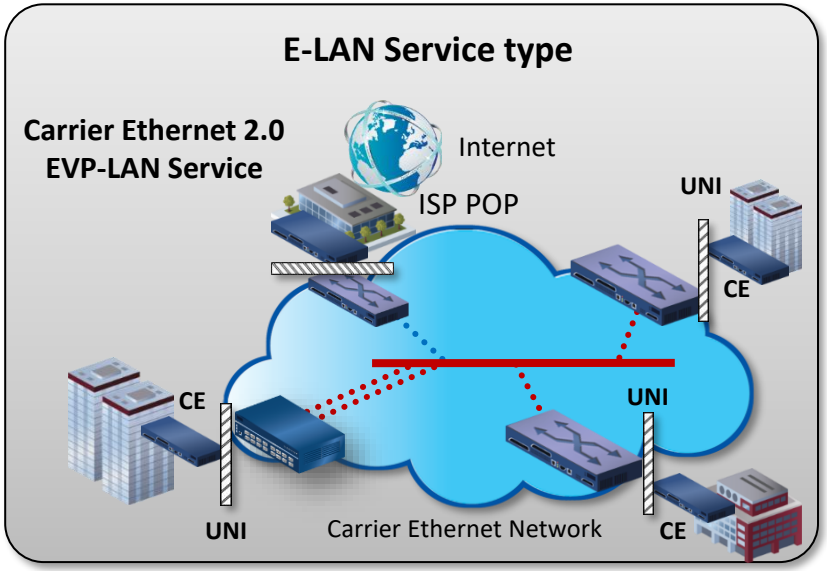
Summary

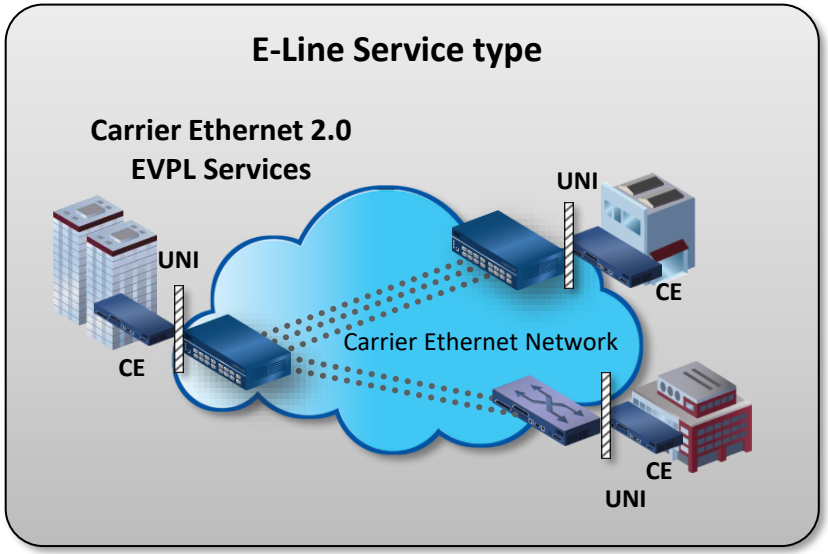
Summary MEF 7.2

- MEF 7.2 provides the EMS-NMS Management Information Model
- Provides the Use Cases needed for the EMS-NMS Management Interface
- Provides detailed functional decomposition
- Shows the linkage between the MEF specific objects and the common models from the ITU-T and TMF

For Full Details …

Please visit
www.metroethernetforum.org
Select Information Center on Left Navigation to access the full specification and extracted MIB files





EVC: Ethernet Virtual Connection

UNI: User Network Interface. the physical demarcation point between the responsibility of the Service Provider and the responsibility of the End-User/Subscriber

CE Customer Equipment

MEF

Accelerating Worldwide Adoption of
Carrier-class Ethernet Networks and Services

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